

Complete Listing of Claims for Reissue Application No. 10/766,488

Claims 1-60: Cancelled

Claim 61: A fiber optic module comprising:

a connector for connection with a mother board;

a laser diode driver to convert serial data received from said mother board to a laser diode electric signal for a laser diode;

a laser diode module to convert said laser diode electric signal to a laser diode optical signal;

a photo diode module to convert a photodiode optical signal to a photo diode electric signal;

a semiconductor integrated circuit to convert said photo diode electric signal to photo diode serial data;

a circuit board to carry thereon said connector, said laser diode driver, said laser diode module and said photo diode module; and

a frame to hold said circuit board, said laser diode module and said photo diode module, wherein said fiber optic module further comprises a module cap to be inserted into light outlet and inlet openings defined by said frame along a light inlet and outlet direction.

Claim 62: A fiber optic module comprising:

a connector for connection with a mother board;

a laser diode driver to convert serial data received from said mother board through said connector to a laser diode electric signal for a laser diode;

a laser diode module including said laser diode, to convert said laser diode electric signal to a laser diode optical signal, said laser diode optical signal adapted for transmission to an optical fiber connected with said laser diode module, said laser diode optical signal having a data transmission rate of 1000 Mbits/s or more;

a photo diode module to convert a photodiode optical signal to a photo diode electric signal, said photodiode optical signal adapted for transmission from an optical fiber connected with said photo diode module, said photodiode optical signal having a data transmission rate of 1000 Mbits/s or more;

a semiconductor integrated circuit to convert said photo diode electric signal to a photo diode serial data, said photo diode serial data adapted for transmission to said mother board through said connector;

a circuit board to carry thereon said connector, said laser diode driver, said laser diode module, said photo diode module and said semiconductor integrated circuit; and

a frame to hold said circuit board, said laser diode module and said photo diode module, said frame comprising an indication part to indicate a satisfied specification of a laser safety standard.

Claim 63: A fiber optic module comprising:

a connector for connection with a mother board;

a laser diode driver to convert serial data received from said mother board through said connector to a laser diode electric signal for a laser diode;

a laser diode module including said laser diode, to convert said laser diode electric signal to a laser diode optical signal, said laser diode optical signal adapted for transmission to an

optical fiber connected with said laser diode module, said laser diode optical signal having a data transmission rate of 1000 Mbits/s or more;

a photo diode module to convert a photodiode optical signal to a photo diode electric signal, said photodiode optical signal adapted for transmission from an optical fiber connected with said photo diode module, said photodiode optical signal having a data transmission rate of 1000 Mbits/s or more;

a semiconductor integrated circuit to convert said photo diode electric signal to a photo diode serial data, said photo diode serial data adapted for transmission to said mother board through said connector;

a circuit board to carry thereon said connector, said laser diode driver, said laser diode module, said photo diode module and said semiconductor integrated circuit;

a frame to hold said circuit board, said laser diode module and said photo diode module, said frame comprising an indication part to indicate a satisfied specification of a laser safety standard; and

a module cap adapted to be inserted into light outlet and inlet openings defined by said frame along a light inlet and outlet direction and adapted to prevent dust from invading said laser diode module and said photo diode module in a non-operative mode of said fiber optic module.

Claim 64: A fiber optic module comprising:

a connector for connection with a mother board;

a laser diode driver to convert serial data received from said mother board through said connector to a laser diode electric signal for a laser diode;

a laser diode module including said laser diode, to convert said laser diode electric signal

to a laser diode optical signal, said laser diode optical signal adapted for transmission to an optical fiber connected with said laser diode module, said laser diode optical signal having a data transmission rate of 1000 Mbits/s or more;

a photo diode module to convert a photodiode optical signal to a photo diode electric signal, said photodiode optical signal adapted for transmission from an optical fiber connected with said photo diode module, said photodiode optical signal having a data transmission rate of 1000 Mbits/s or more;

a semiconductor integrated circuit to convert said photo diode electric signal to a photo diode serial data, said photo diode serial data adapted for transmission to said mother board through said connector;

a circuit board to carry thereon said connector, said laser diode driver, said laser diode module, said photo diode module and said semiconductor integrated circuit;

a frame to hold said circuit board, said laser diode module and said photo diode module, said frame comprising an indication part to indicate a satisfied specification of a laser safety standard; and

a supporting plate to fix said frame to said mother board.

Claim 65: A fiber optic module as set forth in claim 64, wherein said supporting plate is made of metallic material.

Claims 66-68: Cancelled

Claim 69: A fiber optic module adapted for use between at least one optical fiber and a computer

comprising:

a connector for electric connection with the computer;

a laser diode module having an opening adapted for insertion of one of the at least one optical fiber, said laser diode module adapted to output a laser diode optical signal to the at least one optical fiber;

a laser diode driver to drive said laser diode module according to serial data received from the computer through said connector;

a photo diode module having an opening adapted for insertion of one of the at least one optical fiber, said photo diode module adapted to receive a photodiode optical signal from the at least one optical fiber and to convert said photodiode optical signal into a photodiode electric signal;

a semiconductor integrated circuit to output an electric digital signal according to said photodiode electric signal, said electric digital signal adapted for transmission as serial data to the computer through said connector;

a sole circuit board to mount thereon said connector, said laser diode module, said laser diode driver, said photo diode module and said semiconductor integrated circuit; and

a housing to accommodate said circuit board, said laser diode module and said photo diode module; and

a module cap adapted to be inserted into at least one of light outlet and inlet openings defined by said housing and adapted to prevent dust from invading said laser diode module and said photo diode module.

Claim 70: A fiber optic module as set forth in claim 69, wherein said module cap further

comprises at least a projection adapted to oppose at least one of said opening of said laser diode module and said opening of said photo diode module.

Claim 71: A fiber optic module as set forth in claim 70, wherein at least a part of said projection is adapted to be inserted into at least one of said opening of said laser diode module and said opening of said photo diode module.

Claim 72: A fiber optic module as set forth in claim 71, wherein said projection is integrally formed with said module cap being made of resin.

Claim 73: A fiber optic module as set forth in claim 69, wherein said module cap is adapted to be attached to said fiber optic module in a non-operative mode of said fiber optic module.

Claim 74: A fiber optic module as set forth in claim 69, wherein said housing further comprises an indication part to indicate a satisfied specification of a laser safety standard.

Claim 75: A fiber optic module as set forth in claim 74, wherein said laser diode optical signal and said photodiode optical signal are adapted to have a transmission rate of 1000 Mbits/s or more.

Claim 76: A fiber optic module as set forth in claim 74, wherein said indication part comprises a label.

Claim 77: A fiber optic module as set forth in claim 74, wherein said module cap further comprises at least a projection adapted to oppose at least one of said opening of said laser diode module and said opening of said photo diode module.

Claim 78: A fiber optic module as set forth in claim 75, wherein said module cap is made of resin, and further comprises a pair of projections adapted to be inserted into said opening of said laser diode module and said opening of said photo diode module.

Claim 79: A fiber optic module as set forth in claim 76, wherein said module cap further comprises at least a projection adapted to oppose at least one of said opening of said laser diode module and said opening of said photo diode module.

Claim 80: A fiber optic module adapted for use between at lease one optical fiber and a circuit board of a computer comprising:

a connector for electric connection with the circuit board of the computer;

a laser diode module having an opening adapted for insertion of one of the at least one optical fiber, said laser diode module adapted to output a laser diode optical signal to the at least one optical fiber;

a laser diode driver to drive said laser diode module according to serial data received from the computer through said connector;

a photo diode module having an opening adapted for insertion of one of the at least one optical fiber, said photo diode module adapted to receive a photodiode optical signal from the at least one optical fiber and to convert said photodiode optical signal into a photodiode electric

signal;

a semiconductor integrated circuit to output an electric digital signal according to said photodiode electric signal, said electric digital signal adapted for transmission as serial data to the computer through said connector;

a sole circuit board to mount thereon said connector, said laser diode module, said laser diode driver, said photo diode module and said semiconductor integrated circuit; and

a housing to accommodate said circuit board, said laser diode module and said photo diode module; and

a supporting plate to fix said housing to the circuit board of the computer.

Claim 81: A fiber optic module as set forth in claim 80, wherein said supporting plate is made of metallic material.

Claim 82: A fiber optic module adapted for use between at least one optical fiber and a circuit board of a computer comprising:

a connector for electric connection with the circuit board of the computer;

a laser diode module having an opening adapted for insertion of one of the at least one optical fiber, said laser diode module adapted to output a laser diode optical signal to the at least one optical fiber, said laser diode optical signal having a transmission rate of 1000 Mbits/s or more;

a laser diode driver to drive said laser diode module according to serial data received from the computer through said connector;

a photo diode module having an opening adapted for insertion of one of the at least one

optical fiber, said photo diode module adapted to receive a photodiode optical signal from the at least one optical fiber and to convert said photodiode optical signal into a photodiode electric signal, said photodiode optical signal having a transmission rate of 1000 Mbits/s or more;

a semiconductor integrated circuit to output an electric digital signal according to said photodiode electric signal, said electric digital signal adapted for transmission as serial data to the computer through said connector;

a sole circuit board to mount thereon said connector, said laser diode module, said laser diode driver, said photo diode module and said semiconductor integrated circuit;

a housing to accommodate said circuit board, said laser diode module and said photo diode module, said housing comprising an indication part to indicate a satisfied specification of a laser safety standard;

a module cap adapted to be inserted into at least one of light outlet and inlet openings defined by said housing and adapted to prevent dust from invading said laser diode module and said photo diode module; and

a metallic supporting plate to fix said housing to the circuit board of the computer.

Claim 83: A fiber optic module as set forth in claim 82, wherein said indication part comprises a label.

Claim 84: A fiber optic module as set forth in claim 82, wherein said module cap further comprises at least a projection adapted to oppose at least one of said opening of said laser diode module and said opening of said photo diode module.

Claim 85: A fiber optic module as set forth in claim 83, wherein said module cap further comprises at least a projection adapted to oppose at least one of said opening of said laser diode module and said opening of said photo diode module.

Claims 86-88: Cancelled

Claim 89: A fiber optic module adapted for use between at least one optical fiber and a computer comprising:

a connector for electric connection with the computer;

a laser diode module having an opening adapted for insertion of one of the at least one optical fiber, said laser diode module adapted to output a laser diode optical signal to the at least one optical fiber;

a laser diode driver to drive said laser diode module according to serial data received from the computer through said connector;

a photo diode module having a photo diode element and an opening adapted for insertion of one of the at least one optical fiber, said photo diode element adapted to receive a photodiode optical signal from the at least one optical fiber and to convert said photodiode optical signal into a current signal;

an amplifier to convert said current signal into a voltage signal;

a shaping circuit to convert said voltage signal into a digital signal, said digital signal adapted to be transmitted as serial data to the computer through said connector, said amplifier being located between said photo diode element and said shaping circuit;

a sole circuit board to mount thereon, said connector, said laser diode module, said laser

diode driver, said photo diode module, said amplifier and said shaping circuit;

a housing to accommodate said circuit board, said laser diode module and said photo diode module; and

a module cap adapted to be inserted into at least one of light outlet and inlet openings defined by said housing and adapted to prevent dust from invading said laser diode module and said photo diode module.

Claim 90: A fiber optic module as set forth in claim 89, wherein said module cap further comprises at least a projection to oppose at least one of said opening of said laser diode module and said opening of said photo diode module.

Claim 91: A fiber optic module as set forth in claim 90, wherein at least a part of said projection is inserted into at least one of said opening of said laser diode module and said opening of said photo diode module.

Claim 92: A fiber optic module as set forth in claim 91, wherein said projection is integrally formed with said module cap being made of resin.

Claim 93: A fiber optic module as set forth in claim 89, wherein said module cap is adapted to be attached to said fiber optic module in a non-operative mode of said fiber optic module.

Claim 94: A fiber optic module as set forth in claim 89, wherein said housing further comprises an indication part to indicate a satisfied specification of a laser safety standard.

Claim 95: A fiber optic module as set forth in claim 94, wherein said laser diode optical signal and said photodiode optical signal are adapted to have a transmission rate of 1000 Mbits/s or more.

Claim 96: A fiber optic module as set forth in claim 94, wherein said indication part comprises a label.

Claim 97: A fiber optic module as set forth in claim 94, wherein said module cap further comprises at least a projection adapted to oppose at least one of said opening of said laser diode module and said opening of said photo diode module.

Claim 98: A fiber optic module as set forth in claim 95, wherein said module cap is made of resin, and further comprises a pair of projections adapted to be inserted into said opening of said laser diode module and said opening of said photo diode module.

Claim 99: A fiber optic module as set forth in claim 96, wherein said module cap further comprises at least a projection adapted to oppose at least one of said opening of said laser diode module and said opening of said photo diode module.

Claim 100: A fiber optic module adapted for use between at least one optical fiber and a circuit board of a computer comprising:

a connector for electric connection with the circuit board of the computer;

a laser diode module having an opening adapted for insertion of one of the at least one optical fiber, said laser diode module adapted to output a laser diode optical signal to the at least one optical fiber;

a laser diode driver to drive said laser diode module according to serial data received from the computer through said connector;

a photo diode module having a photo diode element and an opening adapted for insertion of one of the at least one optical fiber, said photo diode element adapted to receive a photodiode optical signal from the at least one optical fiber and to convert said photodiode optical signal into a current signal;

an amplifier to convert said current signal into a voltage signal;

a shaping circuit to convert said voltage signal into a digital signal, said digital signal adapted to be transmitted as serial data to the computer through said connector, said amplifier being located between said photo diode element and said shaping circuit;

a sole circuit board to mount thereon, said connector, said laser diode module, said laser diode driver, said photo diode module, said amplifier and said shaping circuit;

a housing to accommodate said circuit board, said laser diode module and said photo diode module; and

a supporting plate to fix said frame to the circuit board of the computer.

Claim 101: A fiber optic module as set forth in claim 100, wherein said supporting plate is made of metallic material.

Claim 102: A fiber optic module adapted for use between at least one optical fiber and a circuit board of a computer comprising:

a connector for electric connection with the circuit board of the computer;

a laser diode module having an opening adapted for insertion of one of the at least one optical fiber, said laser diode module adapted to output a laser diode optical signal to the at least one optical fiber, said laser diode optical signal having a transmission rate of 1000 Mbits/s or more;

a laser diode driver to drive said laser diode module according to serial data received from the computer through said connector;

a photo diode module having a photo diode element and an opening adapted for insertion of one of the at least one optical fiber, said photo diode element adapted to receive a photodiode optical signal from the at least one optical fiber and to convert said photodiode optical signal into a current signal, said photodiode optical signal having a transmission rate of 1000 Mbits/s or more;

an amplifier to convert said current signal into a voltage signal;

a shaping circuit to convert said voltage signal into a digital signal, said digital signal adapted to be transmitted as serial data to the computer through said connector, said amplifier being located between said photo diode element and said shaping circuit;

a sole circuit board to mount thereon, said connector, said laser diode module, said laser diode driver, said photo diode module, said amplifier and said shaping circuit;

a housing to accommodate said circuit board, said laser diode module and said photo diode module, said housing comprising an indication part to indicate a satisfied specification of a laser safety standard;

a module cap adapted to be inserted into at least one of light outlet and inlet openings defined by said housing and adapted to prevent dust from invading said laser diode module and said photo diode module; and

a metallic supporting plate to fix said frame to the circuit board of the computer.

Claim 103: A fiber optic module as set forth in claim 102, wherein said indication part comprises a label.

Claim 104: A fiber optic module as set forth in claim 102, wherein module cap further comprises at least a projection to oppose at least one of said opening of said laser diode module and said opening of said photo diode module.

Claim 105: A fiber optic module as set forth in claim 103, wherein module cap further comprises at least a projection to oppose at least one of said opening of said laser diode module and said opening of said photo diode module.

Claim 106: An optical module to transmit serial data to and receive serial data from a motherboard, the optical module comprising:

a serial connector to transfer the serial data;

a laser diode electrical signal converter to convert the received serial data into a laser diode electrical signal;

a laser diode module to convert the laser diode electrical signal into a laser diode optical signal and transmit the laser diode optical signal, wherein the laser diode optical signal is transmitted at a data transmission rate of 1000 Mbits/s or more;

a photo diode module to receive a photo diode optical signal and to convert the photo diode optical signal into a photo diode electrical signal, wherein the received photo diode optical

signal has a data transmission rate of 1000 Mbits/s or more;

a photo diode electrical signal converter to receive the photo diode electrical signal from the photo diode module, to generate the serial data to be transmitted, wherein the serial data is based on the photo diode electrical signal, and to transmit the generated serial data to the serial connector;

a single circuit board having a top surface and a bottom surface; and

a frame to at least partially encase the circuit board, the laser diode module and the photo diode module;

wherein the serial connector and the laser diode electrical signal converter are mounted on the circuit board;

the laser diode module and the photo diode module are electrically connected to the circuit board proximate to a first edge of the circuit board; and

the serial connector is positioned proximate to a second edge of the circuit board that is opposite the first edge of the circuit board.

Claim 107: The optical module of claim 106, wherein the photo diode electrical signal converter comprises a transformer impedance amplifier circuit integrated circuit and a shaping circuit integrated circuit.

Claim 108: The optical module of claim 107, wherein;

the photo diode module transfers a current signal as the photo diode electrical signal;

the transformer impedance amplifier circuit integrated circuit converts the current signal to a voltage signal; and

the shaping circuit integrated circuit converts the voltage signal to the serial data to be transmitted.

Claim 109: The optical module of claim 106, wherein the serial connector extends from the circuit board and comprises a plurality of pins.

Claim 110: The optical module of claim 109, wherein the plurality of pins are positioned substantially parallel to the second edge of the circuit board.

Claim 111: The optical module of claim 106, wherein the serial connector comprises a plurality of contacts located on a surface of the circuit board.

Claim 112: The optical module of claim 111, wherein the photo diode electrical signal converter is mounted on the circuit board.

Claim 113: The optical module of claim 112, wherein the laser diode module and the photo diode module are electrically connected to the circuit board through a plurality of leads.

Claim 114: The optical module of claim 112, wherein;

the plurality of contacts of the serial connector are located on the bottom surface of the circuit board; and

the laser diode electrical signal converter is mounted on the top surface of the circuit board.

Claim 115: The optical module of claim 114, wherein the photo diode electrical signal converter is mounted on the top surface of the circuit board.

Claim 116: The optical module of claim 114, wherein the laser diode module and the photo diode module are electrically connected to the circuit board through a plurality of leads.

Claim 117: The optical module of claim 112, wherein;

the plurality of contacts of the serial connector are located on the bottom surface of the circuit board; and

the photo diode electrical signal converter is mounted on the top surface of the circuit board.

Claim 118: The optical module of claim 106, wherein the optical module further comprises a metallic holder to fix the frame to the mother board, to protect the photo diode module from external electromagnetic noise and to reduce electromagnetic noise radiated from the laser diode module.

Claim 119: The optical module of claim 113, wherein the optical module further comprises a metallic holder to fix the frame to the mother board, to protect the photo diode module from external electromagnetic noise and to reduce electromagnetic noise radiated from the laser diode module.

Claim 120: The optical module of claim 118, wherein the metallic holder comprises a fixing part to be engaged with the mother board.

Claim 121: The optical module of claim 119, wherein the metallic holder comprises a fixing part to be engaged with the mother board.

Claim 122: A module cap for protecting an optical module having a serial connector to transfer serial data between a mother board and the optical module, a laser diode module to output a laser diode optical signal according to serial data received from the mother board, the laser diode module having a first opening through which the laser diode optical signal travels, a photo diode module to receive a photo diode optical signal and to output a photo diode electrical signal according to the photo diode optical signal, the photo diode module having a second opening through which the photo diode optical signal travels, wherein the laser diode module and the photo diode module are mounted on a single circuit board, and a frame to at least partially encase the circuit board, the laser diode module and the photo diode module, wherein the serial connector transfers the serial data to the mother board according to the photo diode electrical signal; the module cap comprising;

a first elastic part to protect the laser diode module; and

a second elastic part to protect the photo diode module;

wherein when the module cap is removably attached to the optical module, foreign matter is prevented from invading into the first opening of the laser diode module and the second opening of the photo diode module.

Claim 123: The module cap of claim 122, wherein;

the first elastic part comprises a first cap projection to be inserted into the first opening of the laser diode module;

the second elastic part comprises a second cap projection to be inserted into the second opening of the photo diode module; and

the module cap is formed such that when the module cap is removably attached to the optical module the module cap contacts the laser diode module comprising a laser diode or the photo diode module comprising a photo diode, and neither the first elastic part nor the second elastic part contact the laser diode or the a photo diode.

Claim 124: The module cap of claim 122, wherein the module cap is formed such that when the module cap is removably attached to the optical module, neither the first elastic part nor the second elastic part contact a laser diode or a photo diode.

Claim 125: The module cap of claim 122, wherein;

the first elastic part comprises a first side cap projection which extends along a longitudinal direction of the first elastic part to facilitate attaching and detaching the module cap; and

the second elastic part comprises a second side cap projection which extends along a longitudinal direction of the second elastic part to facilitate attaching and detaching the module cap.

Claim 126: The module cap of claim 123, wherein;

the first elastic part comprises a first side cap projection which extends along a longitudinal direction of the first elastic part to facilitate attaching and detaching the module cap; and

the second elastic part comprises a second side cap projection which extends along a longitudinal direction of the second elastic part to facilitate attaching and detaching the module cap.

Claim 127: The module cap of claim 126, wherein;

the first side cap projection is provided on an outer surface of the first elastic part; and the second side cap projection is provided on an outer surface of the second elastic part.

Claim 128: A fiber optic module for transmitting serial data to and receiving serial data from a computer, the fiber optic module comprising:

a surface mount type connector for connecting the fiber optic module to a computer;
a laser diode driver to convert serial data received through said surface mount type connector to a laser diode electrical signal for a laser diode;
a laser diode module including said laser diode, to convert said laser diode electrical signal to a laser diode optical signal, said laser diode optical signal adapted for transmission to an optical fiber, said laser diode optical signal having a data transmission rate of 1000 Mbits/s or more;

a photo diode module to receive a photo diode optical signal from an optical fiber, and to convert the photo diode optical signal to a photo diode electrical signal, said photo diode optical signal having a data transmission rate of 1000 Mbits/s or more;

a semiconductor integrated circuit to output a photo diode serial data according to said photo diode electrical signal, said photo diode serial data adapted for transmission through said surface mount type connector;

a sole circuit board to mount thereon said surface mount type connector, said laser diode driver, said laser diode module, said photo diode module and said semiconductor integrated circuit; and

a housing to accommodate said circuit board, said laser diode module and said photo diode module;

wherein said laser diode module and said photo diode module are mounted proximate to a first end of said circuit board, and said surface mount type connector is mounted proximate to a second end of said circuit board that is opposite said first end of said circuit board.

Claim 129: The fiber optic module of claim 128, wherein said surface mount type connector comprises a plurality of contacts located on a surface of said circuit board.

Claim 130: The fiber optic module of claim 129, wherein said laser diode module and said photo diode module are electrically connected to said circuit board through a plurality of leads.

Claim 131: The fiber optic module of claim 129, wherein;

said plurality of contacts of said surface mount type connector are located on a bottom surface of said circuit board; and

said laser diode driver is mounted on a top surface of said circuit board.

Claim 132: The fiber optic module of claim 131, wherein said semiconductor integrated circuit is mounted on said top surface of said circuit board.

Claim 133: The fiber optic module of claim 131, wherein said laser diode module and said photo diode module are electrically connected to said circuit board through a plurality of leads.

Claim 134: The fiber optic module of claim 129, wherein;

 said plurality of contacts of said surface mount type connector are located on a bottom surface of said circuit board; and

 said semiconductor integrated circuit is mounted on a top surface of said circuit board.

Claim 135: The fiber optic module of claim 128, wherein said optical module further comprises a metallic holder to fix said housing to the computer, to protect said photo diode module from external electromagnetic noise and to reduce electromagnetic noise radiated from said laser diode module.

Claim 136: The fiber optic module of claim 131, wherein said optical module further comprises a metallic holder to fix said housing to the computer, to protect said photo diode module from external electromagnetic noise and to reduce electromagnetic noise radiated from said laser diode module.

Claim 137: The fiber optic module of claim 135, wherein said metallic holder comprises a fixing part to be engaged with the computer.

Claim 138: The fiber optic module of claim 136, wherein said metallic holder comprises a fixing part to be engaged with the computer.

Claim 139: An optical module for transmitting and receiving serial data with a motherboard, the optical module comprising:

- a serial connector to transfer the serial data;
- a laser diode electrical signal converter to convert the received serial data into a laser diode electrical signal;
- a laser diode module to convert the laser diode electrical signal into a laser diode optical signal and transmit the laser diode optical signal;
- a photo diode module to receive a photo diode optical signal and to convert the photo diode optical signal into a photo diode electrical signal;
- a photo diode electrical signal converter to convert the photo diode electrical signal into the serial data to be transmitted to the motherboard;
- a single circuit board having a top surface and a bottom surface; and
- a frame;
 - wherein the serial connector and the laser diode electrical signal converter are mounted on the circuit board;
 - the laser diode module and the photo diode module are electrically connected to the circuit board proximate to a first edge of the circuit board;
 - the frame at least partially encases the circuit board, the laser diode module and the photo diode module; and

the serial connector is positioned proximate to a second edge of the circuit board that is opposite the first edge of the circuit board.

Claim 140: The optical module of claim 139, wherein the laser diode module and the photo diode module are substantially thermally isolated from the circuit board.

Claim 141: The optical module of claim 139, wherein the laser diode module and the photo diode module are positioned such that they extend beyond the first edge of the circuit board.

Claim 142: The optical module of claim 139, wherein the laser diode module and the photo diode module are substantially separated from the circuit board.

Claim 143: The optical module of claim 139, wherein the laser diode module and the photo diode module are proximate to and substantially separate from the circuit board, and are electrically connected the circuit board through a plurality of leads.

Claim 144: The optical module of claim 139, wherein the laser diode module and the photo diode module are proximate to and substantially separate from the circuit board to reduce noise.

Claim 145: The optical module of claim 139, wherein the laser diode module and the photo diode module are located outside a perimeter of the top surface of the circuit board.

Claim 146: The optical module of claim 139 wherein the photo diode electrical signal converter

is mounted on the circuit board.

Claim 147: The optical module of claim 139, wherein the serial connector extends from the circuit board and comprises a plurality of pins.

Claim 148: The optical module of claim 147, wherein the plurality of pins are positioned substantially parallel to the second edge of the circuit board.

Claim 149: The optical module of claim 139, wherein the serial connector is positioned substantially parallel to the second edge of the circuit board.

Claim 150: The optical module of claim 139, further comprising a module cap, wherein the module cap is removably attached to the frame such that the laser diode module and the photo diode module are at least partially covered by the module cap.

Claim 151: A method for protecting the optical module of claim 139, the method comprising removably attaching a module cap to the frame to protect the laser diode module and the photo diode module.

Claim 152: A method for protecting the optical module of claim 139, the method comprising removably attaching a module cap to the optical module to protect the laser diode module and the photo diode module.

Claim 153: The method of claim 151, wherein the module cap is formed such that when the module cap is inserted into the frame the laser diode module and the photo diode module are at least partially inserted into the module cap.

Claim 154: The method of claim 151, wherein when the module cap is inserted into the frame, at least a portion of the module cap is inserted into each of the laser diode module and the photo diode module.

Claim 155: The optical module of claim 139, wherein the photo diode optical signal has a data transmission rate of at least 1000 Mbits/s.

Claim 156: The optical module of claim 139, wherein the serial connector is surface mounted.

Claim 157: The optical module of claim 139, further comprising a metallic holder to fix the optical module to a motherboard, to protect the photo diode module from external electromagnetic noise and to reduce electromagnetic noise radiated from the laser diode module.

Claim 158: A module cap for protecting an optical module having a serial connector to transfer serial data between a motherboard and the optical module, a laser diode electrical signal converter to convert the serial data received from the motherboard into a laser diode electrical signal, a laser diode module to convert the laser diode electrical signal into a laser diode optical signal and transmit the laser diode optical signal, a photo diode module to receive a photo diode optical signal and to convert the photo diode optical signal into a photo diode electrical signal, a

photo diode electrical signal converter to convert the photo diode electrical signal into serial data to be transmitted to the motherboard; a single circuit board and a frame, wherein the serial connector and the laser diode electrical signal converter are mounted on the circuit board, the frame at least partially encases the circuit board, the module cap comprising:

- a first elastic part to protect the laser diode module, and
 - a second elastic part to protect the photo diode module;
- wherein the module cap is removably attachable to the optical module.

Claim 159: A module cap for protecting an optical module having a serial connector to transfer serial data between a motherboard and the optical module, a laser diode electrical signal converter to convert the serial data received from the motherboard into a laser diode electrical signal, a laser diode module to convert the laser diode electrical signal into a laser diode optical signal and transmit the laser diode optical signal, a photo diode module to receive a photo diode optical signal and to convert the photo diode optical signal into a photo diode electrical signal, a photo diode electrical signal converter to convert the photo diode electrical signal into serial data to be transmitted to the motherboard; a single circuit board and a frame, wherein the serial connector and the laser diode electrical signal converter are mounted on the circuit board, the frame at least partially encases the circuit board, the module cap comprising:

- a first elastic part to protect the laser diode module, and
 - a second elastic part to protect the photo diode module;
- wherein when the module cap is removably attached to the optical module the first elastic part and the second elastic part protect the laser diode module and the photo diode module from foreign matter.

Claim 160: The module cap of claim 159, wherein the elastic parts are formed such that when the module cap is attached to the optical module the laser diode module is at least partially inserted into the first elastic part and the photo diode module is at least partially inserted into the second elastic part.

Claim 161: The module cap of claim 159, further comprising a first cap projection and a second cap projection, such that when the module cap is attached to the optical module, the first cap projection is at least partially inserted into the laser diode module and the second cap projection is at least partially inserted into the photo diode module.

Claim 162: The module cap of claim 159, further comprising a handler to mount and dismount the module cap.

Claim 163: An optical module for transmitting and receiving serial data with a motherboard, the optical module comprising:

- a serial connector to transfer the serial data;
- a laser diode driver to convert the received serial data into a laser diode electrical signal and to drive a laser diode according to the laser diode electrical signal, producing a laser diode optical signal such that the laser diode transmits the laser diode optical signal;
- a photo diode module to receive a photo diode optical signal and to convert the photo diode optical signal into a photo diode electrical signal;
- a photo diode electrical signal converter to convert the photo diode electrical signal into

the serial data to be transmitted;

a single circuit board having a top surface and a bottom surface; and

a frame;

wherein the serial connector and the laser diode electrical signal converter are mounted on the circuit board;

the laser diode and the photo diode module are electrically connected to the circuit board proximate to a first edge of the circuit board;

the frame at least partially encases the circuit board, the laser diode module and the photo diode module; and

the serial connector is positioned proximate to and in parallel with a second edge of the circuit board that is opposite the first edge of the circuit board.

Claim 164: The optical module of claim 163, wherein the photo diode electrical signal converter is mounted on the circuit board.

Claim 165: The optical module of claim 163, wherein the photo diode optical signal has a data transmission rate of at least 1000 Mbits/s.

Claim 166: An optical module for transmitting and receiving serial data with a motherboard, the optical module comprising:

a serial connector to transfer the serial data;

a laser diode electrical signal converter to convert the received serial data into a laser diode electrical signal;

a laser diode module comprising a laser diode to produce and transmit a laser diode optical signal based on the laser diode electrical signal;

a photo diode module to receive a photo diode optical signal and to convert the photo diode optical signal into a photo diode electrical signal;

a photo diode electrical signal converter to convert the photo diode electrical signal into the serial data to be transmitted;

a single circuit board having a top surface and a bottom surface; and

a frame;

wherein the serial connector and the laser diode electrical signal converter are mounted on the circuit board;

the laser diode module and the photo diode module are electrically connected to the circuit board proximate to a first edge of the circuit board;

the frame at least partially encases the circuit board, the laser diode module and the photo diode module; and

the serial connector is positioned proximate to, and in parallel with, a second edge of the circuit board that is opposite the first edge of the circuit board.

Claim 167: The optical module of claim 166, wherein the photo diode electrical signal converter is mounted on the circuit board.

Claim 168: The optical module of claim 166, wherein the photo diode optical signal has a data transmission rate of at least 1000 Mbits/s.

Claim 169: Cancelled

Claim 170: An optical module to transmit serial data to and receive serial data from a motherboard, the optical module comprising:

a serial connector to transfer the serial data;

a laser diode electrical signal converter to convert the received serial data into a laser diode electrical signal;

a laser diode module to convert the laser diode electrical signal into a laser diode optical signal and transmit the laser diode optical signal, wherein the laser diode optical signal is transmitted at a data transmission rate of 1000 Mbits/s or more;

a photo diode to receive a photo diode optical signal and produce a photo diode current signal, wherein the received photo diode optical signal has a data transmission rate of 1000 Mbits/s or more;

an integrated circuit electrically coupled to the photo diode to produce serial data to be transmitted, wherein the serial data is based on the photo diode current signal, and to transmit the produced serial data to the serial connector;

a single circuit board having a top surface and a bottom surface; and

a frame to at least partially encase the circuit board, the laser diode module and the integrated circuit;

wherein the serial connector, the laser diode electrical signal converter, and the integrated circuit are mounted on the circuit board;

the laser diode module and the photo diode are electrically connected to the circuit board proximate to a first edge of the circuit board; and

the serial connector is positioned proximate to a second edge of the circuit board that is opposite the first edge of the circuit board.

Claim 171: An optical module to transmit serial data to and receive serial data from a motherboard, the optical module comprising:

a serial connector to transfer the serial data;

a laser diode electrical signal converter to convert the received serial data into a laser diode electrical signal;

a laser diode module to convert the laser diode electrical signal into a laser diode optical signal and transmit the laser diode optical signal, wherein the laser diode optical signal is transmitted at a data transmission rate of 1000 Mbits/s or more;

a photo diode to receive a photo diode optical signal and produce a current signal, wherein the received photo diode optical signal has a data transmission rate of 1000 Mbits/s or more;

a first converter to convert the current signal to a voltage signal;

a second converter to convert the voltage signal to serial data, wherein the serial data is based on the current signal, and to transmit the converted serial data to the serial connector;

a single circuit board having a top surface and a bottom surface; and

a frame to at least partially encase the circuit board, the laser diode module and the second converter;

wherein the serial connector, the laser diode electrical signal converter, and the second converter are mounted on the circuit board;

the laser diode module and the photo diode are electrically connected to the circuit board

proximate to a first edge of the circuit board; and

the serial connector is positioned proximate to a second edge of the circuit board that is opposite the first edge of the circuit board.

Claim 172: An optical module to transmit serial data to and receive serial data from a motherboard, the optical module comprising:

a serial connector to transfer the serial data;

a laser diode electrical signal converter to convert the received serial data into a laser diode electrical signal;

a laser diode module to convert the laser diode electrical signal into a laser diode optical signal and transmit the laser diode optical signal;

a photo diode module to receive a photo diode optical signal and to convert the photo diode optical signal into a photo diode electrical signal;

a photo diode electrical signal converter to receive the photo diode electrical signal from the photo diode module, generate the serial data to be transmitted, wherein the serial data is based on the photo diode electrical signal, and to transmit the generated serial data to the serial connector;

a single circuit board having a first surface and a second surface; and

a frame to at least partially encase the circuit board, the laser diode module and the photo diode module;

wherein the serial connector and the laser diode electrical signal converter are mounted on the circuit board;

the laser diode module and the photo diode module are electrically connected to the circuit board proximate to a first edge of the circuit board; and

the serial connector is positioned proximate to a second edge of the circuit board that is opposite the first edge of the circuit board.

Claim 173: The optical module of claim 172, further comprising at least one variable resistor to adjust the laser diode electrical signal.

Claim 174: The optical module of claim 172, wherein the laser diode optical signal has a wavelength of 780nm.

Claim 175: The optical module of claim 172, wherein the laser diode optical signal is emitted with a maximum power of 5 mW.

Claim 176: An optical module to transmit serial data to and receive serial data from a motherboard, the optical module comprising:

a serial connector to transfer the serial data;

a laser diode electrical signal converter to convert the received serial data into a laser diode electrical signal;

a laser diode module to convert the laser diode electrical signal into a laser diode optical signal and transmit the laser diode optical signal;

a photo diode module to receive a photo diode optical signal and to convert the photo diode optical signal into a photo diode electrical signal;

a photo diode electrical signal converter to receive the photo diode electrical signal from the photo diode module, generate the serial data to be transmitted, wherein the serial data is based on the photo diode electrical signal, and to transmit the generated serial data to the serial connector;

a single circuit board having a first surface and a second surface; and

a frame to at least partially encase the circuit board, the laser diode module and the photo diode module;

wherein the serial connector and the laser diode electrical signal converter are mounted

on the circuit board;

the laser diode module and the photo diode module are electrically connected to the circuit board proximate to a first edge of the circuit board; and
a plurality of pins to mount the optical module to the motherboard are fixed to the frame.

Claim 177: The optical module of claim 176, wherein the pins are integrally fixed to the frame.

Claim 178: An optical module to transmit serial data to and receive serial data from a motherboard, the optical module comprising:

a serial connector to transfer the serial data;
a laser diode electrical signal converter to convert the received serial data into a laser diode electrical signal;
a laser diode module to convert the laser diode electrical signal into a laser diode optical signal and transmit the laser diode optical signal;
a photo diode module to receive a photo diode optical signal and to convert the photo diode optical signal into a photo diode electrical signal;
a photo diode electrical signal converter to receive the photo diode electrical signal from the photo diode module, generate the serial data to be transmitted, wherein the serial data is based on the photo diode electrical signal, and to transmit the generated serial data to the serial connector;
a single circuit board having a first surface and a second surface;
a frame to at least partially encase the circuit board, the laser diode module and the photo diode module;
a laser diode module shield to shield the laser diode module; and
a photo diode module shield to shield the photo diode module
wherein the serial connector and the laser diode electrical signal converter are mounted on the circuit board;

the laser diode module and the photo diode module are electrically connected to the circuit board proximate to a first edge of the circuit board; and

the serial connector is positioned proximate to a second edge of the circuit board that is opposite the first edge of the circuit board.

Claim 179: The optical module of claim 178, wherein the laser diode module shield and the photo diode module shield the laser diode module and the photo diode module, respectively, from electromagnetic and electrostatic noise.

Claim 180: An optical module to transmit serial data to and receive serial data from a motherboard, and to transmit optical data across an optical fiber having an optical plug, the optical module comprising:

a serial connector to transfer the serial data;

a laser diode electrical signal converter to convert the received serial data into a laser diode electrical signal;

a laser diode module to convert the laser diode electrical signal into a laser diode optical signal and transmit the laser diode optical signal;

a photo diode module to receive a photo diode optical signal and to convert the photo diode optical signal into a photo diode electrical signal;

a photo diode electrical signal converter to receive the photo diode electrical signal from the photo diode module, generate the serial data to be transmitted, wherein the serial data is based on the photo diode electrical signal, and to transmit the generated serial data to the serial connector;

a single circuit board having a first surface and a second surface;

a frame to at least partially encase the circuit board, the laser diode module and the photo diode module; and

a plurality of pawls to removably engage a fiber optic plug to the optical module;

wherein the serial connector and the laser diode electrical signal converter are mounted on the circuit board; and

the laser diode module and the photo diode module are electrically connected to the circuit board.

Claim 181: The optical module of claim 180, wherein the pawls are formed from the frame.

Claim 182: A module cap comprising:

a first cap portion and a second cap portion to protect a laser diode module and a photo diode module of an optical module, respectively,

wherein the first cap portion and the second cap portion are each formed having a cavity with a projection formed therein, and into each of said cavities one of a laser diode module and a photo diode module is at least partially inserted when the module cap is attached to the optical module.

Claim 183: The optical module of claim 182, further comprising a handle to facilitate removably attaching the module cap to the optical module.

Claim 184: A module cap for protecting an optical module having a laser diode module and a photo diode module, the module cap comprising:

a laser diode projection; and

a photo diode projection;

wherein the module cap is formed having a laser diode cavity into which the laser diode module is at least partially inserted and a photo diode cavity into which the photo diode module is at least partially inserted, and

the laser diode projection is formed in the laser diode cavity and the photo diode

projection is formed in the photo diode cavity.

Claim 185: A module cap for protecting an optical module, wherein the module cap is formed having a laser diode cavity and a photo diode cavity, the module cap comprising:

- a laser diode projection formed in the laser diode cavity; and
- a photo diode projection formed in the photodiode cavity.